

## **SEALED FLEXIBLE CARTRIDGE**

### **Cross-Reference to Related Application**

This application is a continuation of International application PCT/EP02/05064 filed May 7, 2002, the entire content of which is expressly incorporated herein by reference thereto.

### **Background**

The present invention relates to a sealed flexible cartridge, designed to be extracted under pressure, containing a substance for the preparation of a beverage chosen from roasted and ground coffee, soluble coffee, a mixture of ground coffee and soluble coffee, a chocolate product or any other dehydrated consumable substance, consisting of a first and a second sheet of circular, oval or polygonal shape which leave between them a space for the substance and are welded together around their periphery, the first sheet being made of a material chosen from filter paper, a non-woven material and a semi-rigid material and the second sheet being made of a material chosen from filter paper, a non-woven material and a composite.

There are already on the market sealed cartridges which open up owing to the effect of the rise in pressure. European Patent application 512,468-A1 relates to such a cartridge: the problem with these cartridges is that they require a pointed extraction device to pierce the top of the cartridge and recessed and raised elements to allow the bottom of the cartridge to be opened and thus allow the coffee to flow into the cup. There are also cartridges made of filter paper such as that forming the subject of European Patent application 272,432-A1. The problem with these cartridges is that the water runs too quickly onto the bed of coffee, without a large rise in pressure, resulting in a coffee without a good quantity of foam remaining thereon. Thus, there is a need for improvements in these type devices, and this need is now met by the present invention.

### **Summary of the Invention**

The present invention now makes available to the user a cartridge requiring for extraction of the beverage such as coffee therein a less expensive and simpler device which nevertheless provides a coffee having a good quality foam thereon.

The present invention relates to a sealed cartridge comprising first and second sheet materials joined to form a space therebetween, and a beverage-forming substance for preparing a beverage located in the space between the sheets. The first material is designed to admit water into the cartridge for extraction of the beverage from the substance, and the second material has properties to retain the water or beverage in the cartridge until an overpressure of 0.1 to 3 bar is achieved, at which overpressure the second material will rupture to allow the extracted beverage to exit the cartridge. The beverage-forming substance may be roasted and ground coffee, soluble coffee, a chocolate beverage forming substance or a mixture thereof.

The first sheet material is preferably paper, a non-woven fiber or plastic material, or a semi-rigid material, while the second material is paper, a non-woven fiber or plastic material, or a composite material, optionally containing weakened or prescored regions. If desired, the second sheet may include a removable cover.

Both the first and second sheets can be made of a material that acts as an oxygen barrier so that no further packaging of the cartridge is required. Otherwise, when either or both of the sheets are not made of a material that acts as an oxygen barrier, a further packaging of the cartridge is required to prevent oxygen deterioration of the beverage-forming substance.

#### Brief Description of the Drawings

The remainder of the description is given with reference to the drawings in which:

Figures 1 and 2 are schematic representations of the cartridge according to the invention, in the first and second embodiments;

Figure 3 is a schematic representation of the cartridge in one of the two first embodiments;

Figure 4 is a schematic representation according to the third embodiment; and

Figure 5 is a schematic representation according to the fourth embodiment.

#### Detailed Description of the Preferred Embodiments

The present invention makes available a cartridge which is not homogeneous in terms of the material surrounding the substance to be extracted, namely between the first and second sheet. The second sheet must retain the water so that the water has time to wet and swell the coffee grains: this delay effect will give good extraction of

the coffee and a good foam. The duration of the delay effect will depend on the water feed pump, that is to say it will depend on what the pressure rise in the cartridge will be. Normally, the delay effect for an overpressure of 1-3 bar is of the order of one second. Of course, it will be necessary nevertheless to provide a support plate under the second sheet of the cartridge during extraction, on account of the rise in pressure.

If the cartridge contains coffee, this is roasted and ground coffee either simply placed in the cartridge or compacted. The amount of coffee or other beverage-forming substance that is present may vary between 5 and 10 g.

If the first sheet is made of filter paper or a non-woven material, the water will flow into the bed of coffee in the cartridge simply by gravity. On the other hand, if the first sheet is made of a semi-rigid material, a piercing means will be required to open the said first sheet, for example with a device according to European Patent application 242,556-A1. In the case of filter paper, a paper having a density of 15 to 30 g/m<sup>2</sup> and a thickness of between 0.1 and 1 mm is used. In the case of a non-woven material, polypropylene, polyethylene, polyethylene terephthalate or polyurethane with a density of between 20 and 100 g/m<sup>2</sup> is used. In the case of a semi-rigid material, aluminum with a thickness of 20 to 100 microns, pure or multi-layer plastic optionally with an oxygen barrier layer, such as an ethylene/vinyl alcohol copolymer ("EVOH") or poly-vinylidene chloride ("PVDC"), a multi-layer film such as cardboard, aluminum, plastic or cardboard, plastic optionally with an oxygen barrier layer such as EVOH or PVDC can be used.

In a first embodiment, the second sheet comprises weakened regions which open when the pressure in the cartridge reaches a value of between 0.1 and 3 bar. The expression "weakened regions" is understood to mean prescored regions. These may also be filter paper, a non-woven material or even a plastic sheet.

In a second embodiment, the second sheet is made of filter paper or of a non-woven material having a sufficiently tight mesh to allow water to pass through it only when a pressure of between 0.1 and 3 bar is reached. The expression "sufficiently tight mesh" is understood to mean a low air or water permeability.

In these two embodiments, the first sheet may be either made of filter paper and a non-woven material or made of a semirigid material. In both cases, the cartridge must have exterior packaging, as it is not packaged in materials forming an oxygen barrier.

In a third embodiment, the second sheet is an plastic/plastic composite. The expression “aluminum/ plastic composite” is understood to mean an aluminum sheet with a prescored plastic sheet on top of it. In this case, if the first sheet is filter paper or a nonwoven material, an exterior packaging will be required. On the other hand, if the first sheet is made of the semirigid material, the exterior packaging will be unnecessary, since the plastic/plastic layers prevent the passage of oxygen.

In a fourth embodiment, the second sheet is composed of a cover which is removed and of a layer made of filter paper or of a non-woven material allowing water to pass through it at a pressure of between 0.1 and 3 bar. In the latter case, exterior packaging is unnecessary.

In a fifth embodiment, the second sheet is made of filter paper or a non-woven material that is coated with a layer of lacquer.

In a sixth embodiment, the second sheet is made of a 15 non-woven material which has undergone a heat treatment.

In the cartridge (1) according to Figure 1, the roasted and ground coffee (2) is packaged between a first sheet (3) made of filter paper and a second sheet (4) also made of filter paper. The two sheets are welded together at (5) around the periphery of the cartridge. The first sheet allows water at atmospheric pressure to pass through it, whereas the second sheet, also made of filter paper, includes weakened regions so that, during extraction, the coffee is firstly well wetted, then it swells well and the liquid coffee flows out only when an overpressure of the order of 1 bar is reached within the cartridge. There is therefore a delay effect in the passage of the coffee, which results in a coffee having a good volume of high-quality foam, which remains. With this cartridge, it is possible to use an extraction system without any point, simply with means for housing the cartridge in a well-sealed manner and for effecting the extraction.

Figure 2 shows a cartridge (6) with ground and roasted coffee (7) packaged between two sheets of non-woven materials.

The first sheet (8) is a sheet of non-woven material which allows water at atmospheric pressure to pass through it. The second sheet (9) is made of a non-woven material having a tight mesh allowing water to pass through it when the overpressure inside the cartridge reaches 1 bar. The two sheets are welded together around their periphery at (10). It is possible to use the same extraction system as for the previous cartridge.

In the case of Figure 3, the cartridge (11) comprises a first sheet (12) made of a semi-rigid material of aluminum and a second sheet (13) made of filter paper. The roasted and ground coffee (14) is placed between these two sheets. These sheets are welded around their periphery (15). For extraction from this cartridge, a needle is required to pierce the first sheet, for example that forming the subject of European Patent application 242,556-A1. The sheet made of filter paper allows the coffee to pass through it when an overpressure of the order of 1 bar is reached in the cartridge during extraction.

Figure 4 shows a cartridge (16) according to the third embodiment. The ground and roasted coffee (17) is packaged between a rigid first sheet made of aluminum (18) and a composite formed from an aluminum sheet (19) and a prescored plastic sheet (20). The sheets (19) and (20) are welded to the sheet (18) at (21). To pierce the sheet (18), the needle according to the aforementioned European patent application is required. The sheet (19) has a thickness such that it has no mechanical strength: its function is to be an oxygen barrier. The sheet (20) opens when the overpressure in the cartridge reaches 1 bar. The benefit of this solution is that it requires no exterior packaging.

Figure 5 shows a cartridge (22) in its fourth embodiment. The ground and roasted coffee (24) is packaged between a rigid sheet (23) and a second sheet formed from a filter paper layer (25) and a cover (26). The sheets (25) and (26) are welded to the sheet (23) at (27). For extraction, the cover (26) is removed and the said cartridge is placed in a device according to European Patent application 242,556-A1. In this case too, it is unnecessary to provide exterior packaging.